

Pollutant	Reference or equivalent	Manual or automated	Applicable part 50 appendix	Applicable subparts of part 53					
				A	B	C	D	E	F
PM ₁₀	Equivalent	Manual	Q	✓		✓			
		Automated	Q	✓		✓			
	Reference	Manual	J	✓			✓		
	Equivalent	Manual	J	✓		✓	✓		
PM _{2.5}		Automated	J	✓		✓	✓		
	Reference	Manual	L	✓				✓	
	Equivalent Class I	Manual	L	✓		✓		✓	
	Equivalent Class II	Manual	L ¹	✓		✓ ²		✓	✓ ^{1 2}
PM _{10-2.5}	Equivalent Class III.	Automated	L ¹	✓		✓		✓	✓ ¹
	Reference	Manual	L, O	✓				✓	
	Equivalent Class I	Manual	L, O	✓		✓		✓	
	Equivalent Class II	Manual	L, O	✓		✓ ²		✓	✓ ^{1 2}
	Equivalent Class III.	Automated	L ¹ , O ¹	✓		✓		✓	✓ ¹

1. Some requirements may apply, based on the nature of each particular candidate method, as determined by the Administrator.

2. Alternative Class III requirements may be substituted.

[75 FR 35597, June 22, 2010]

APPENDIX A TO SUBPART A OF PART 53— REFERENCES

(1) American National Standard Quality Systems—Model for Quality Assurance in Design, Development, Production, Installation, and Servicing, ANSI/ISO/ASQC Q9001-1994. Available from American Society for Quality, P.O. Box 3005, Milwaukee, WI 53202 (<http://qualitypress.asq.org>).

(2) American National Standard Quality Systems for Environmental Data and Technology Programs—Requirements with guidance for use, ANSI/ASQC E4-2004. Available from American Society for Quality P.O. Box 3005, Milwaukee, WI 53202 (<http://qualitypress.asq.org>).

(3) Dimensioning and Tolerancing, ASME Y14.5M-1994. Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

(4) Mathematical Definition of Dimensioning and Tolerancing Principles, ASME Y14.5.1M-1994. Available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

(5) ISO 10012, Quality Assurance Requirements for Measuring Equipment-Part 1: Meteorological confirmation system for measuring equipment):1992(E). Available from American Society for Quality Control, 611 East Wisconsin Avenue, Milwaukee, WI 53202.

(6) Quality Assurance Guidance Document 2.12. Monitoring PM_{2.5} in Ambient Air Using Designated Reference or Class I Equivalent Methods. U.S. EPA, National Exposure Research Laboratory, Research Triangle Park, NC, November 1998 or later edition. Currently available at <http://www.epa.gov/ttn/amtic/pmqaainf.html>.

[62 FR 38784, July 18, 1997, as amended at 71 FR 61278, Oct. 17, 2006]

Subpart B—Procedures for Testing Performance Characteristics of Automated Methods SO₂, CO, O₃, and NO₂

§ 53.20 General provisions.

(a) The test procedures given in this subpart shall be used to test the performance of candidate automated methods against the performance specifications given in table B-1. A test analyzer representative of the candidate automated method must exhibit performance better than, or equal to, the specified value for each such specification (except Range) to satisfy the requirements of this subpart. Except as provided in paragraph (b) of this section, the range of the candidate method must be the range specified in table B-1 to satisfy the requirements of this subpart.

(b) For a candidate method having more than one selectable measurement range, one range must be that specified in table B-1 (standard range for SO₂), and a test analyzer representative of the method must pass the tests required by this subpart while operated in that range. The tests may be repeated for one or more broader ranges (*i.e.*, ones extending to higher concentrations) than the range specified in table B-1, provided that the range does not extend to concentrations more than four times the upper range limit specified in table B-1. For broader

ranges, only the tests for range (calibration), noise at 80% of the upper range limit, and lag, rise and fall time are required to be repeated. The tests may be repeated for one or more narrower ranges (ones extending to lower concentrations) than that specified in table B-1. For SO₂ methods, table B-1 specifies special performance requirements for narrower (lower) ranges. For methods other than SO₂, only the tests for range (calibration), noise at 0% of the measurement range, and lower detectable limit are required to be repeated. If the tests are conducted or passed only for the specified range (standard range for SO₂), any FRM or FEM method determination with respect to the method will be limited to that range. If the tests are passed for both the specified range and one or more broader ranges, any such determination will include the additional range(s) as well as the specified range, provided that the tests required by subpart C of this part (if applicable) are met for the broader range(s). If the tests are passed for both the specified range and one or more narrower ranges, any FRM or FEM method determination for the method will include the narrower range(s) as well as

the specified range. Appropriate test data shall be submitted for each range sought to be included in a FRM or FEM method determination under this paragraph (b).

(c) For each performance specification (except Range), the test procedure shall be initially repeated seven (7) times to yield 7 test results. Each result shall be compared with the corresponding specification in table B-1; a value higher than or outside that specified constitutes a failure. These 7 results for each parameter shall be interpreted as follows:

(1) Zero (0) failures: Candidate method passes the performance parameter.

(2) Three (3) or more failures: Candidate method fails the performance parameter.

(3) One (1) or two (2) failures: Repeat the test procedures for the parameter eight (8) additional times yielding a total of fifteen (15) test results. The combined total of 15 test results shall then be interpreted as follows:

(i) One (1) or two (2) failures: Candidate method passes the performance parameter.

(ii) Three (3) or more failures: Candidate method fails the performance parameter.

TABLE B-1—PERFORMANCE SPECIFICATIONS FOR AUTOMATED METHODS

Performance parameter	Units ¹	SO ₂		O ₃	CO	NO ₂	Definitions and test procedures
		Std. range ³	Lower range ^{2,3}				
1. Range	ppm	0–0.5	<0.5	0–0.5	0–50	0–0.5	Sec. 53.23(a).
2. Noise	ppm	0.001	0.0005	0.005	0.5	0.005	Sec. 53.23(b).
3. Lower detectable limit	ppm	0.002	0.001	0.010	1.0	0.010	Sec. 53.23(c).
4. Interference equivalent							
Each interferent	ppm	±0.005	±0.005	±0.02	±1.0	±0.02	Sec. 53.23(d).
Total, all interferents	ppm	—	—	0.06	1.5	0.04	Sec. 53.23(d).
5. Zero drift, 12 and 24 hour	ppm	±0.004	±0.002	±0.02	±1.0	±0.02	Sec. 53.23(e).
6. Span drift, 24 hour							
20% of upper range limit	Percent ...	—	—	±20.0	±10.0	±20.0	Sec. 53.23(e).
80% of upper range limit	Percent ...	±3.0	±3.0	±5.0	±2.5	±5.0	Sec. 53.23(e).
7. Lag time	Minutes ...	2	2	20	10	20	Sec. 53.23(e).
8. Rise time	Minutes ...	2	2	15	5	15	Sec. 53.23(e).
9. Fall time	Minutes ...	2	2	15	5	15	Sec. 53.23(e).
10. Precision							
20% of upper range limit	ppm	—	—	0.010	0.5	0.020	Sec. 53.23(e).
80% of upper range limit	Percent ...	2	2	—	—	—	Sec. 53.23(e).
	ppm	—	—	0.010	0.5	0.030	Sec. 53.23(e).
	Percent ...	2	2	—	—	—	Sec. 53.23(e).

1. To convert from parts per million (ppm) to µg/m³ at 25 °C and 760 mm Hg, multiply by M/0.02447, where M is the molecular weight of the gas. Percent means percent of the upper range limit.

2. Tests for interference equivalent and lag time do not need to be repeated for any lower SO₂ range provided the test for the standard range shows that the lower range specification is met for each of these test parameters.

3. For candidate analyzers having automatic or adaptive time constants or smoothing filters, describe their functional nature, and describe and conduct suitable tests to demonstrate their function aspects and verify that performances for calibration, noise, lag, rise, fall times, and precision are within specifications under all applicable conditions. For candidate analyzers with operator-selectable time constants or smoothing filters, conduct calibration, noise, lag, rise, fall times, and precision tests at the highest and lowest settings that are to be included in the FRM or FEM designation.

4. For nitric oxide interference for the SO₂ UVF method, interference equivalent is ±0.003 ppm for the lower range.

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(d) The tests for *zero drift*, *span drift*, *lag time*, *rise time*, *fall time*, and *precision* shall be combined into a single sequential procedure to be conducted at various line voltages and ambient temperatures specified in § 53.23(e). The tests for *noise*, *lower detectable limit*, and *interference equivalents* shall be made at any temperature between 20 °C. and 30 °C. and at any normal line voltage between 105 and 125 volts, and shall be conducted such that not more than three (3) test results for each parameter are obtained per 24 hours.

(e) All response readings to be recorded shall first be converted to concentration units according to the calibration curve constructed in accordance with § 53.21(b).

(f) All recorder chart tracings, records, test data and other documentation obtained from or pertinent to these tests shall be identified, dated, signed by the analyst performing the test, and submitted.

NOTE: Suggested formats for reporting the test results and calculations are provided in Figures B-2, B-3, B-4, B-5, and B-6 in appendix A. Symbols and abbreviations used in this subpart are listed in table B-5, appendix A.

[40 FR 7049, Feb. 18, 1975, as amended at 40 FR 18168, Apr. 25, 1975; 41 FR 52694, Dec. 1, 1976; 75 FR 35598, June 22, 2010]

§ 53.21 Test conditions.

(a) *Set-up and start-up* of the test analyzer shall be in strict accordance with the operating instructions specified in the manual referred to in § 53.4(b)(3). Allow adequate warm-up or stabilization time as indicated in the operating instructions before beginning the tests. The test procedures assume that the test analyzer has an analog measurement signal output that is connected to a suitable strip chart recorder of the servo, null-balance type. This recorder shall have a chart width of a least 25 centimeters, chart speeds up to 10 cm per hour, a response time of 1 second or less, a deadband of not more than 0.25 percent of full scale, and capability either of reading measurements at least 5 percent below zero or of offsetting the zero by at least 5 percent. If the test analyzer does not have an analog signal output, or if other types of measurement data output are used, an alter-

native measurement data recording device (or devices) may be used for the tests, provided it is reasonably suited to the nature and purposes of the tests and an analog representation of the analyzer measurements for each test can be plotted or otherwise generated that is reasonably similar to the analog measurement recordings that would be produced by a conventional chart recorder.

(b) *Calibration* of the test analyzer shall be as indicated in the manual referred to in § 53.4(b)(3) and as follows: If the chart recorder does not have below zero capability, adjust either the controls of the test analyzer or the chart recorder to obtain a +5% offset zero reading on the recorder chart to facilitate observing negative response or drift. If the candidate method is not capable of negative response, the test analyzer (not recorder) shall be operated with an offset zero. Construct and submit a calibration curve showing a plot of recorder scale readings (ordinate) against pollutant concentrations (abscissa). A plot of output units (volts, millivolts, milliamps, etc.) against pollutant concentrations shall also be shown for methods not including an integral chart recorder. All such plots shall consist of at least seven (7) approximately equally spaced, identifiable points, including 0 and 90±5 percent of full scale.

(c) Once the test analyzer has been set up and calibrated and the tests started, manual adjustment or normal periodic maintenance is permitted only every 3 days. Automatic adjustments which the test analyzer performs by itself are permitted at any time. The submitted records shall show clearly when any manual adjustment or periodic maintenance was made and describe the operations performed.

(d) If the test analyzer should malfunction during any of the performance tests, the tests for that parameter shall be repeated. A detailed explanation of the malfunction, remedial action taken, and whether recalibration was necessary (along with all pertinent records and charts) shall be submitted. If more than one malfunction occurs, all performance test procedures for all parameters shall be repeated.